

Amendments to the Specification:

Please add the following new paragraph after the Title and before the first line of the paragraph beginning on line 6 of page 1.

This application is a continuation of U.S. Patent Application No. 10/031,858, filed June 13, 2002, which is a U.S. National Phase Application of PCT International Application PCT/JP00/03003.

Please add the following new paragraph after the paragraph ending on line 2 of page 3.

An object detecting device can prevent a seizure of an object between an opening and an opening-closing unit for opening and closing the opening. The object detecting device includes a pressure-sensitive sensor disposed at one of the opening and the opening-closing unit, and judging means for judging the contact of the object with the pressure-sensitive sensor on the basis of an output signal of the pressure-sensitive sensor. The pressure-sensitive sensor includes pressure-sensitive means for generating an output signal depending on deformation, and support means for supporting the pressure-sensitive means at the one of the opening and the opening-closing unit, the support means including a vibration damping portion for damping vibration propagated to the pressure-sensitive means.

Please delete the paragraph, beginning at page 3, line 5.

~~—The invention is to solve these problems of the prior arts, and presents:~~
~~—(A) A pressure sensitive sensor disposed in an opening or an opening-closing unit, being easily deformed by pressure of an object;~~
~~—(B) An object detecting device for detecting contact of an object with the pressure sensitive sensor, securely by using the pressure sensitive sensor; and~~
~~—(C) An opening-closing device capable of reducing the load applied to the object until releasing the seizure when the object is seized.~~

Please delete the paragraph, beginning at page 3, line 16.

~~—The pressure sensitive sensor disclosed in the invention comprises:~~
~~—(a) pressure sensitive means for generating an output signal depending on deformation;~~
~~and~~

~~—(b) support means for supporting the pressure sensitive means at least on one of an opening, and an opening-closing unit for opening and closing this opening, in which the support means is more flexible than the pressure sensitive means. Owing to this feature, when an object contacts with the pressure sensitive sensor, the support means deforms easily together with the pressure sensitive means so as not to impede deformation of the pressure sensitive means, and the pressure sensitive sensor generates a sufficient output signal for detection.~~

Please delete the paragraph, beginning at page 3, line 29.

~~—The sensitivity of the pressure sensitive means is enhanced by providing the support means with a deformation amplifying portion for amplifying the deformation of the pressure sensitive means. The sensitivity of the pressure sensitive means is further enhanced by forming a hollow part in the deformation amplifying portion so that the hollow part is deformed by the pressure of the object to increase the deformation amount of the pressure sensitive means.~~

Please delete the paragraph, beginning at page 4, line 7.

~~—When the support means is provided with a vibration damping unit, undesired vibration propagated to the pressure sensitive means is damped, and the pressure sensitive means does not issue such an output signal as to cause a detection error.~~

Please delete the paragraph, beginning at page 4, line 12.

~~—Further, when the vibration damping unit serves also as the deformation amplifying portion, and the support means is formed of a part of the weather strip of automobile, the components are reduced in number and rationalized.~~

Please delete the paragraph, beginning at page 4, line 16.

~~—As the pressure sensitive means is disposed in the opening so that the shortest distance to the opening-closing unit is in a range of 3 mm to 5 mm, it is possible to detect the seizure of a bar of which minimum diameter is 4 mm or more as required in FMVSS118, which is the United States regulation about seizure in power window, etc.~~

Please delete the paragraph, beginning at page 4, line 22.

~~—The reliability is enhanced by disposing resistors for detecting breakage of electrodes between plural electrodes for leading out signals of the pressure sensitive sensor.~~

Please delete the paragraph, beginning at page 4, line 25.

~~—The pressure sensitive sensor may be also formed of a flexible piezoelectric sensor, so that the support means supports the piezoelectric sensor flexibly along the shape of the mounting portion. As a result, the degree of freedom of design of the mounting portion is heightened, and it is easy to increase the mechanical strength in design. Moreover, since the gap is narrowed between the pressure sensitive sensor and the seizure portion, when an object is seized, the object securely contacts with the pressure sensitive sensor.~~

Please delete the paragraph, beginning at page 5, line 4.

~~—The piezoelectric sensor is molded by using a compound piezoelectric material mixing amorphous chlorinated polyethylene, crystalline chlorinated polyethylene, and piezoelectric ceramic powder. Having both the flexibility of amorphous chlorinated polyethylene and the high temperature durability of crystalline chlorinated polyethylene, it is free from decreasing of sensitivity at high temperature as experienced in the conventional piezoelectric sensor using polyvinylidene fluoride as piezoelectric material, and the high temperature durability is excellent and vulcanizing process is not needed when molding, so that the production efficiency is superior.~~

Please delete the paragraph, beginning at page 5, line 15.

~~—The invention further presents an object detecting device comprising this pressure sensitive sensor, and means for judging contact of an object on the basis of the output signal from the pressure sensitive sensor.~~

Please delete the paragraph, beginning at page 5, line 19.

~~—The safety is enhanced by providing this object detecting device with notice means for reporting the judging result of the judging means to a third party.~~

Please delete the paragraph, beginning at page 5, line 22.

~~—By connecting the pressure sensitive sensor directly to the judging means, and integrating the pressure sensitive sensor and judging means into one body, connectors and other connecting parts are not necessary, contact failure and other troubles are eliminated, and the reliability is enhanced, and further the components are rationalized.~~

Please delete the paragraph, beginning at page 5, line 28.

~~—The judging means is further provided with a filter for extracting a specified frequency component only from the output signal of the pressure sensitive sensor. The filter removes the output signal due to undesired vibration propagated to the pressure sensitive sensor, and therefore the precision of judging contact of an object is enhanced. The reliability of the device is enhanced by judging function abnormality of the sensor on the basis of the output signal of the pressure sensitive sensor corresponding to the vibration.~~

Please delete the paragraph, beginning at page 6, line 7.

~~—The object detecting device of the invention further includes a discharge unit for discharging the electric charge generated in the piezoelectric sensor. If the ambient temperature changes and an electric charge is generated in the piezoelectric sensor due to pyroelectric effect, since this electric charge is discharged by the discharging unit, it is free from judging errors of contact of an object due to changes of ambient temperature.~~

Please delete the paragraph, beginning at page 6, line 15.

~~—The judging means calculates the integrated value of the output signal of pressure sensitive sensor per unit time, and judges contact of an object on the basis of this integrated value.~~

~~Even if the pushing speed of pressure of the object to the pressure sensitive sensor is slow, or even if a soft object contacts, the contact of the object can be judged securely.~~

Please delete the paragraph, beginning at page 6, line 21.

~~—Further in this object detecting device, a bypass unit for passing high frequency signals is provided between a signal input unit from the pressure sensitive sensor and a signal output unit for issuing the judging result of contact of the object. As a result, if a strong electric field at high frequency is applied to the pressure sensitive sensor or judging means and high frequency signals invade from the signal input unit, the high frequency signals are passed to the signal output unit to escape to outside of the judging means, judging errors do not occur. Further, by setting the signal input unit and signal output unit closer to each other and shortening the bypass route of the high frequency signals, judging errors of contact of an object do not occur if high frequency signals invade from the signal input unit.~~

Please delete the paragraph, beginning at page 7, line 5.

~~—Moreover, the invention presents an opening closing device comprising this object detecting device, drive means for driving the opening closing unit, and control means for controlling the drive means so as to open the opening closing unit on the basis of the output signal of the judging means. This opening closing device judges the contact with an object promptly and securely, and stops the closing action of the opening closing unit or opens it. Therefore, the load applied to the object from beginning of the seizure of an object until cancellation of the seizure is reduced.~~

Please delete the paragraph, beginning at page 7, line 15.

~~—The opening closing device of the invention further comprises a contact judging unit of the opening closing unit for detecting the driving state such as opening or closing speed and driving current when the drive means drives the opening closing unit, and judging contact of the object with the opening closing unit on the basis of the detected driving state. The drive means is controlled on the basis of the output signal of either the judging unit or the object detecting device. For example, when either the object detecting device or the contact judging unit of the~~

~~opening-closing unit judges the seizure, the drive means is controlled so as to stop the closing action of the opening-closing unit or to open it, so that the safety is enhanced.~~

Please delete the paragraph, beginning at page 7, line 27.

~~—If a function abnormality occurs in the object detecting device, the control means controls the drive means on the basis of the output signal of the contact judging unit of the opening-closing unit, so that the safety is enhanced.~~

Please delete the paragraph, beginning at page 8, line 1.

~~—In the opening-closing device of the invention, when closing the opening-closing unit, the control means controls the drive means so as to close after opening once for a specific distance or a specific time. In this method, if the pressure of the object is already applied to the pressure-sensitive sensor before closing the opening-closing unit and the pressure-sensitive sensor cannot be deformed, after the deformation of the pressure-sensitive sensor is once restored, the pressure-sensitive sensor is deformed again by the pressure of the object. As a result, contact of the object is judged, and the seizure of the object can be prevented.~~

Please add the following new paragraph after the paragraph ending on line 14 of page 10.

Fig. 25 shows the pressure-sensitive sensor shown in Fig. 4.

Please replace the paragraph, beginning at page 15, line 17, with the following rewritten paragraph:

Fig. 25 shows the pressure-sensitive sensor 54. The central electrode 20 may be an ordinary metal single wire conductor, but an electrode winding a metal coil 20B around the an insulating polymer fiber 20A is used in this embodiment. As the insulating polymer fiber 20A, polyester fiber used commercially in heated blanket is used, and as the metal coil 20B, copper alloy containing silver by 5 wt.% is preferred.

Please replace the paragraph, beginning at page 15, line 23, with the following rewritten paragraph:

The outside electrode 21 is a band-shaped electrode having a metal film 21B adhered on ~~the~~ polymer layer 21A, and it is wound around the composite piezoelectric layer 22. As the polymer layer 21A, polyethylene terephthalate (PET) is used, and the electrode having an aluminum film 21B adhered thereon has a high thermal stability at 120°C and is mass-produced commercially, and hence it is preferred as the outside electrode 21. When connecting this electrode to the judging means 5, it is hard to solder the aluminum film, and hence it is connected, for example, by crimping or by using eyelet. Or by winding metal single wire coil or metal braided wire around the aluminum film of the outside electrode 21 to conduct with the aluminum film, the metal single wire coil or metal braided wire may be soldered to the judging means 5. In this case, soldering is possible, and the working efficiency is improved. Meanwhile, to shield the piezoelectric sensor from electric noise of the external environments, it is preferred to wind the outside electrode 21 around the composite piezoelectric layer 22 so as to be overlaid partially.

Please delete the subtitle, beginning at page 41, line 12.

~~INDUSTRIAL APPLICABILITY~~

Amendments to the Drawings:

Figure 25 has been newly added.

Attachment